SYNAPSE™
Wireless Data System

User Manual

Wireless Data System

Synapse™

Zen

Revision 7

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Introduction

Synapse is a highly innovative data capture system, which has been specifically developed for easy installation and reliable operation even in the most demanding environments.
The system is designed to comply with CFR-21 part 11 electronic record signature and security requirements as they apply to electronic data capture systems.
Synapse is a fully integrated system which uses a specially developed secure wireless protocol which incorporates 'Zen gateway' technology instead of the usual 'broadcast' methods used in many wireless systems. This patented technology overcomes the problems normally associated with wireless data capture systems, namely losing contact and duplication of data. The protocol is based on a duplex data link which enables a fully transparent data packet resend mechanism which guarantees reliable data capture.
System installation is simplified by the Synapse 'Zen' installation technology which allows each unit in the network to automatically search and select the appropriate signal path for best performance and stability. The search protocol is based on our latest Zen (Network aware) meshing system.
This allows each unit (node) in the network to dynamically work out the best method and route to use to get its' data back to the system hub and to configure itself automatically.
The wireless units use the latest sensor technology to provide accurate and reliable data which is practically immune to interference.
The wireless protocol incorporates a sophisticated 5 stage data packet validation algorithm to ensure that all data is received without errors.
The hub of the system is the synapse receiver to which all wireless data packets are sent. It is a fully network enabled device which can run autonomously or in conjunction with the Synapse Server Software /Client suite of applications.
These application allow for both remote system configuration and maintenance as well as multi-user data access via remote client application with secure user logon.
To ensure that data is not lost in the event of power or computer failure, all the Synapse system units are battery backed and in addition the Synapse receiver stores up to around 200,000 data points. The storage capacity can be expanded by fitting a standard memory card for storage up to 750 Million data points if required. Once the Synapse receiver is reconnected to the system server the Server and receiver data are automatically synchronised to ensure that the databases are fully up to date. Configuration data is also saved to the memory card allowing easy replacement of system elements without the risk of data loss.
Synapse also integrates comprehensive alarm and user notification which allows the system to notify users of any out of limit excursions via email or phone.
The Synapse system itself can be linked to an existing alarm system if required to provide an additional level of security.

The system is supplied with full technical support from the manufacturer to provide you with any installation and configuration needs that you may have. Synapse provides a host of additional innovative features aimed at providing a comprehensive but simple to use data capture system.
In addition to the wireless data transfer technology the Synapse system also incorporates the ability to send data via existing computer networks to allow for either fully wireless, fully wired or a combination of both technologies. Selection of the appropriate Synapse units allows data capture systems to be easily installed in any environment where other systems would not be appropriate or would be many times the cost. An added benefit of the Synapse system is that it can be easily extended throughout the local site or even implemented across multiple sites.

SYSTEM PLANNING

IMPORTANT

Please read this manual carefully before attempting to install or modify a Synapse system. Maximum system performance and reliability can only be obtained by proper installation and setting up of this system. Improper settings or use can cause erratic system behaviour

Synapse is a fully integrated system which means that all units that constitute a given system need to function correctly to allow for proper operation. It is therefore essential that a proper installation and configuration is carried out if reliable and trouble free operation is to be achieved.
AtlasTechnology Limited can supply a comprehensive installation service where required.

The following information should be gathered if possible to enable a properly configured system to be supplied.

- Number of system receivers required
- Number of wireless sensors required along with probe types
- Physical layout plans of the facility in which Synapse is to be installed
- High and Low Alert and Alarm set points for each unit
- Alarm Delay for each unit
- Logging interval for each unit
- Is Synapse Software required
- What level of Validation does the system implementation require.

For more information on the Sensor units themselves and their features see the section *Synapse Transceivers*.

Should any of the above information not be available then the system can be configured during installation or a member of the Atlas technical help team can assist.

While it is possible for the end user to install the system it is highly recommended that installation is carried out by a qualified installation engineer.

Please read the following sections for detailed information on the operation of the various Synapse System components.

Synapse Receiver Operation

The Synapse receiver is the hub of the system and the way in which it is configured will determine the functionality of the system.
Please take time to read this section to determine the way in which the system will be used and configured.

Before operating the receiver it should be fully installed in its final location and the internal battery should be connected. Refer to the section *Synapse System Installation* for more details on how to do this.

IMPORTANT!
Once the system has been installed the system receiver should not be relocated as this can cause erratic system behaviour.

Start up sequence

Once the receiver has been switched on it will display the Synapse logo for 5 seconds and then perform a self test which will take approximately 15 seconds.
Please do not press any buttons during this self test.
Any faults found during this test will be indicated on the display.
The test report screen also displays the capacity of the memory card if one has been installed.
If the unit has been set-up to obtain an IP address automatically then a message will be displayed indicating this and it will wait until it has found a DHCP server before proceeding.
Pressing any key at this point will skip this operation.

- Skipping this operation will cause the unit to set the IP address to 0.0.0.0 which will prevent network operation.

NOTE: If the receiver fails to connect after switching on DHCP support but has been assigned an IP address then remove power (including the internal battery) from the unit and restart it.

If the unit has been set-up to connect to a Synapse Server Software then a message will be displayed indicating this and it will wait until a server has been found.
Pressing any key at this point will skip this operation.

- If this operation is skipped then the unit will continue to search for a server and connect when one is found.

See the section *Synapse Software* for more details on this.

The receiver will now be in normal operation mode.
The receiver will automatically skip the DHCP and server searches after 15 seconds if the search is unsuccessful.

All the functions within the Synapse receiver are accessed through a series of tabbed pages which allow viewing of system information or for system configuration in the case where the user does not have access to the Synapse software. The following sections explain the features found on each page and how to set them.
Navigating through the pages and entering information is carried out via the soft keys below the display. They are referred to as soft keys because the function of each key will vary depending on the system context.
The function of each key is indicated by the symbol that appears directly above it on the display.

The following table explains the possible symbol meanings.

Symbol	Meaning
	Next page to the right
	Next page to the left
	Next item up
	Next item down
	Backup
	Try unlock code
	Increment selected value
	Decrement selected value
	Next item
	Select

Whenever these symbols appear above a key then pressing this key will perform the indicated function.

DISPLAY Page

This page is for information display only.

The large area to the upper left displays information from the last data packet received from a remote sensor. This information will continue to be displayed until either a new data packet is received or another page is selected.
If no data has been received since selecting the page then 'WAITING FOR DATA' will be displayed.

The three rectangular areas above the key icons indicated the following information (from right to left).

- Current receiver date setting
- Receiver system status
- Current receiver time setting

- Connecting the receiver to a Synapse server will cause the time and date to be synchronised with the time and date on the server PC.

The Following table lists the possible Receiver Status indications.

Status indication	Meaning
ACTIVE	The system is active and awaiting data
POWER	Mains power has been disconnected from the system
LOW BAT	The internal battery is almost discharged
ALARM	A remote sensor has triggered an alarm
FAULT	The system has detected an internal fault

- When the system is operating on battery power the display backlight will dim 15 seconds after the last key press and the Synapse logo will flash. Pressing any key will cause the backlight to switch back to full brightness for a further 15 seconds.
  This feature is intended to save power and extend operating time when the system is running on battery power.

The Rectangular area at the upper right of the screen displays four bar graphs which are used to indicate the following system information.

Indicates the mains power input voltage level. The meter should remain at approximately 50% when the system is operating on external supply.

Indicates the current battery voltage and hence remaining capacity if powered from internal battery. The unit will shut down once the meter drops below approximately 10%.

Displays the current Radio frequency signal level at the system operating frequency. Indication will vary depending on environmental conditions.

This bar graph indicates the Synapse server connection status.
Once the receiver is connected to a synapse server the meter should remain above approximately 50%. Should the meter drop to 0% then connection with the server has been lost and the receiver will revert back to ‘search’ mode.
See the section *Synapse Software* for more details.

In addition to the symbols and icons already described a number of additional icons may be displayed at the bottom centre of the screen. These icons and their meanings are described in the following table. See the relevant sections for more detail.
These icons are displayed on all pages.

Symbol	Meaning
	A memory card is fitted
	No memory card is fitted
	The keypad is unlocked
	The keypad is locked
	The memory capacity has been exceeded since the last download

IMPORTANT
When a memory card is fitted then all stored data is saved to the card and not to internal memory. All memory functions such as Validation of saved data also apply to the memory card contents and not the internal memory.
Moving the memory card to a different receiver will make the data accessible to that unit.
The following table indicates approximate data storage capacities for the most common memory card sizes.
Note that both full height and half height cards are supported.

Card Size	Data Storage Capacity (data points)
4Mb	360,000
8Mb	720,000
16Mb	1,400,000
32Mb	2,800,000
64Mb	5,750,000
128Mb	11,500,000
256Mb	23,000,000
512Mb	46,000,000
1Gb	92,000,000
2Gb	180,000,000
4Gb	360,000,000

Fitting a memory card

Disconnect the receiver power supply.
Remove the front cover of the system receiver.
Plug the memory card into the card slot located at the lower centre of the receiver control circuit board. Ensure that the card is pushed fully home and that the writing on the card faces outwards.
If a half height card is being used then detach the card extension piece.
Refit the receiver cover and restart the receiver.
The card will be automatically detected as indicated by the card capacity being reported during the self test and the memory card symbol appearing at the bottom centre of the receiver display.

Pressing the right key will display the *STATUS* page.

STATUS page

This page is for information display only.

The following table explains the meaning of the information displayed on this page.

Title	Meaning
TOTAL DATA ENTRIES	Total number of stored data points
NEW DATA ENTRIES	Number of data points not yet downloaded
BATTERY VOLTAGE	Internal battery voltage
SUPPLY VOLTAGE	Voltage of external supply – if connected
DHCP RENEWALS	Number of IP lease renewals from DHCP server

Pressing the right key will display the *ALARM* page.

Pressing the left key will display the *DISPLAY* page.

ALARM page

Any alarm sent to the receiver from a remote sensor is stored in the internal data log. This page allows the user to search the data log to display any alarm entries in the data log.
Alarms are stored until overwritten by new data.

Pressing the down key will start a search backward through the data log and if found the next oldest alarm entry will be displayed.
If no alarms older than the current one is found then the message 'OLDEST ALARM IS DISPLAYED' will be shown.

Pressing the up key will start a search forward through the data log and if found the next most recent alarm entry will be displayed.
If no alarms more recent than the current one is found then the message 'NEWEST ALARM IS DISPLAYED' will be shown.

During the search the message box above the key icons will indicate 'SEARCHING DATA LOG'
and the backup key icon will displayed.
Pressing this key during a search will abort the search and the message 'SEARCH ABORTED' will be displayed.

Should no alarms be found in the data log then the message
'NO ALARMS FOUND'
will be displayed.

Pressing the right key will display the *SETUP* page.

Pressing the left key will display the *STATUS* page.

SETUP page

This page allows the user to configure the basic system parameters.

To select each parameter in turn press the down key . If the last parameter is already selected then the first parameter will be selected.
The current selection is indicated by alternately displaying normal/Inverse (White on Blue/Blue on white).

CHANGE PASSWORD

Synapse has been designed to be compatible with use in validated and CFR compliant installations. It may therefore be necessary to limit access to certain system functions in order to maintain the required compliance.
The password feature of the system is designed to limit access by requiring the user to enter a password before allowing entry into the system.
Once the system has been unlocked by entering the correct password all system parameters can be accessed and adjusted as required.

- Setting the password to 0000 will disable the system lock feature

The icon at the bottom centre of the screen indicates the status of the system lock as detailed in the following table.

Icon	Meaning
	System is locked
	System is unlocked

The change password feature allows the user to set the password to one of their own choosing.

To change the system password press the select key
Enter the current password into the dialog box that appears.
Then enter the required password and press the key to save.

Default Password

The default password when the receiver is shipped is = 0000 (Lock disabled)

Pressing the plus key will increment the current digit as indicated by the cursor under the digit.
If the digit required is exceeded then keep pressing the key until the required value is displayed again.

Pressing the next digit key will move the cursor to the next digit.
If the cursor is under the last digit it will be moved back to the first digit.

Pressing the unlock key will attempt to unlock the system using the selected code.
If successful then the System lock icon will change to indicating that the system is unlocked and the dialog box will close.

Should the wrong code be entered then a warning tone will be given and the system will remained locked as indicated by the system lock icon .

Pressing the backup key will close the dialog box without unlocking the system

WARNING!

If the system lock code is lost or forgotten then the entire system will require resetting and all system set-up data will be lost.

DATE

This parameter allows the user to set the system date.
Note that if the system is connected to a Synapse server then the server time and date takes precedence and the time and date will revert back to the server time and date.

To set the date press the select key
Enter the unlock code if required.
The first digit of the date will begin to flash.

Press the plus key to increment the value.

Press the minus key to decrement the value.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the date is correct to exit date setting mode.

TIME
This parameter allows the user to set the system time.
Note that if the system is connected to a Synapse server then the server time and date takes precedence and the time and date will revert back to the server time and date.

To set the time press the select key
Enter the unlock code if required.
The first digit of the time will begin to flash.
Press the plus key to increment the value.

Press the minus key to decrement the value.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the time is correct to exit time setting mode.

CORRECT FOR BST
Setting this option to 'ON' will cause the receiver to display the time and date corrected for British summer time.
Setting this option to 'OFF' will cause the receiver to display the absolute time and date. This option should be set to 'OFF' when the system is connected to a synapse server.

- Changing this setting does not change the actual time and date value, It only changes the way time is displayed on the receiver.

To change the setting press the select key

LOW BATTERY ALARM
Setting this option to 'ON' will cause the receiver to generate a low battery alarm if its' internal battery voltage drops below 7.5V.

Setting this option to 'OFF' will prevent a low battery alarm from being generated.

- This alarm is not related to the remote sensor low battery alarm.

To change the setting press the select key

Pressing the right key will display the *INSTALL* page.

Pressing the left key will display the *ALARM* page.

INSTALL page

This page allows the user to enable or disable data logging and alarming for each remote sensor in the system and also set the receiver ID number.

See the section *Synapse Transceivers* for more details on ID numbers.

SETUP SENSOR NUMBER

ENABLE DATA LOGGING
If set to ‘ON’ then when a data packet is received from the remote sensor with the matching ‘SENSOR NUMBER’ it’s data is saved to the receiver data log and made available to the Synapse Server Software if used.
Setting this option to ‘OFF’ will prevent data for this unit from being saved to the data log.

ENABLE ALARMS
If set to ‘ON’ then alarm codes received from the remote sensor with the matching ‘SENSOR NUMBER’ will trigger an alarm.
Setting this option to ‘OFF’ will prevent this unit from generating alarms.

- Setting both parameters to ‘OFF’ will effectively disable the remote sensor but the receiver will still communicate with it in response to system level requests.
- To generate data or alarms from each channel on a remote sensor then those channels must be enabled on the remote sensor.
  See the section *Synapse Transceivers* for more details.

To set-up a sensor unit press the down key to increment the selected number until the required sensor number is displayed.
Pressing both the down key and the select key simultaneously will change the down key function to up allowing the sensor number to be decremented.
Pressing them again will switch back to a down key function.
Once the required ID number is selected press the select key repeatedly until the required settings have been made for the Data and Alarm parameters. If the system lock is enabled then you may have to enter the password before you can make any changes.

RECEIVER ID
Selecting ID number 0 allows the setting of the receiver ID which is indicated in the box above the key icons.
The receiver ID allows the remote sensors in the system to communicate with the correct receiver in a multi-receiver system. It also enables the Synapse Server Software to identify which receiver any received data is coming from.

IMPORTANT!
Changing this parameter after system installation will cause all remote units to lose contact with the receiver.

Pressing the right key will display the *NETWORK* page.

Pressing the left key will display the *SETUP* page.

NETWORK page

This page allows the setting of the basic parameters required to use the receiver on a network.

To select each parameter in turn press the down key If the last parameter is already selected then the first parameter will be selected.
The current selection is indicated by alternately displaying normal/Inverse (White on Blue/Blue on white).

- Please consult your IT department before changing any of these settings as the required settings are dependant on the network configuration.

USE DHCP SERVER

Setting this option to ‘ON’ will cause the receiver to search for a DHCP server in order to obtain an IP address when it is first powered up. If this option is on then you will be unable to manually set the IP address.
Setting this option to ‘OFF’ will prevent the receiver from searching for a DHCP server and an IP address will have to be manually assigned.
When this option is off the IP address obtained will be used.

To change this setting press the select key
You may have to enter the unlock code.

IP ADDRESS

This option is only accessible if ‘USE DHCP SERVER’ is set to ‘OFF’ and allows the user to manually assign an IP address.

To set the IP address press the select key
Enter the unlock code if required.
The first digit of the address will begin to flash.

Press the plus key to increment the value. Holding the key down will cause the value to automatically increment.

Press the minus key to decrement the value. Holding the key down will cause the value to automatically decrement.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the IP address is correct to exit address setting mode.

MASK
This option is only accessible if ‘USE DHCP SERVER’ is set to ‘OFF’
and allows the user to manually assign a network mask.

To set the mask value press the select key .
Enter the unlock code if required.
The first digit of the address will begin to flash.

Press the plus key to increment the value. Holding the key down will cause the value to automatically increment.

Press the minus key to decrement the value. Holding the key down will cause the value to automatically decrement.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the mask is correct to exit the setting mode.

GATEWAY
This option is only accessible if ‘USE DHCP SERVER’ is set to ‘OFF’
and allows the user to manually assign a network gateway address.

To set the Gateway address press the select key
Enter the unlock code if required.
The first digit of the address will begin to flash.

Press the plus key to increment the value. Holding the key down will cause the value to automatically increment.

Press the minus key to decrement the value. Holding the key down will cause the value to automatically decrement.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the mask is correct to exit address setting mode.

MAC
This is for information purposes only and displays the receiver MAC address.

IMPORTANT
The IP address assigned to the unit must be valid for the network on which it is to operate. Check with the network IT administrator where required.

Pressing the right key will display the *SERVER* page.

Pressing the left key will display the *INSTALL* page.

After changing any network settings you may be prompted to restart the system.
You should always restart the system to ensure that any changes will take effect.

SERVER page

This page allows the receiver to be manually configured to connect to the Synapse server software. The advantages of manually configuring the server connection is the receiver will be able to connect across multiple Network Sub-nets.

- Please consult your IT department before changing any of these settings as the required settings are dependant on the network configuration.

AUTO CONNECT MODE
Setting this option to ‘ON’ will cause the receiver to search for a Synapse server and will appear in the server list of discovered receivers once it has been detected.
NOTE: This will not work across Network Sub-nets.

Setting this option to ‘OFF’ will enable the manual server connection mode. The following information must be entered.

Server IP Address – This is the IP address of the PC that the Synapse server software is running on.

MAC – This is the MAC address of the PC that the Synapse server software is running on.

It is important that suitable Mask and Gateway settings are entered for the receiver to be able to connect to the Synapse server.
See the previous section, NETWORK page, for more information on how to set these.

To set the values follow these steps

To select each parameter in turn press the down key If the last parameter is already selected then the first parameter will be selected.
The current selection is indicated by alternately displaying normal/Inverse (White on Blue/Blue on white).

To start setting the value press the select key
Enter the unlock code if required.
The first element of the value will begin to flash.

Press the plus key to increment the value. Holding the key down will cause the value to automatically increment.

Press the minus key to decrement the value. Holding the key down will cause the value to automatically decrement.

Press the next digit key to select the next digit. If the last digit is already selected then the first digit will be selected.

Press the select key when the value is correct to exit address setting mode.

Note that if the ‘AUTO CONNECT’ mode is set to ‘ON’ then you will not be able to select the IP Address of MAC values.

The ‘CONNECTION STATUS’ displays the current status of the connection between the receiver and the Synapse server.
When connected it will display ‘CONNECTED’
When not connected it will display ‘DISCONNECTED’

Pressing the right key will display the *UTILITY* page.

Pressing the left key will display the *NETWORK* page.

UTILITY page

This page provides access to the system utility functions

LOCK SYSTEM

Selecting this option will force the system to lock unless the lock is disabled by having the lock password set to 0000.

VALIDATE DATA LOG

This function scans all entries currently saved in the data log and checks that there are no errors in the data.
When each data packet is sent from a wireless sensor the packet contains checksum information which allows the receiver to determine that there are no errors in the data. If any errors are detected then the data is rejected and the receiver requests that the sensor resends the data.
If no errors are detected then the data along with the checksum is saved to the data log.
During the validation process a progress indicator is displayed on the screen. The validation function checks each data log entry against the stored checksum to ensure that the data has not been corrupted. At the end of the validation process the number entries containing errors will be indicated.
When downloading data to the Software server this same mechanism is used and any entries failing the checksum test will not be sent to the server.

To run the validation function press the select key
A dialog box indicating the progress of the validation process is displayed.
Pressing the backup key during the validation process will abort the process.
At the end of the validation process a report on the number of errors found is displayed along with a ‘PASS’ / ‘FAIL’ indication.
Pressing any key will close the dialog box. If no keys are pressed then the dialog box will close after 15 seconds.

- While it is not normal for data entries to contain errors it should be noted that this function is intended as an indication of proper system operation and not as an indication that any data sent to the Software Server will contain errors. Any data which fails the validation process is never sent to the Server.

NOTE:
The validation process can take several minutes in a system containing a large amount of data.

SHUTDOWN SYSTEM
This function should always be selected prior to shutting down the system and is used to ensure that all data and settings are saved.
After selecting this function wait for a message to appear which indicates that it is safe to remove power.
To continue without removing power press any key to reset the receiver.

CLEAR DATA LOG
Selecting this option will delete all data in the receiver memory but will not alter any system settings.
Note
If a memory card is fitted then the card contents are cleared and if a memory card is not fitted then the internal memory is cleared.

WARNING!

SELECTING THIS FUNCTION WILL ERASE ALL STORED DATA

To delete the data log press the select key
You may have to enter the unlock code.

A warning dialog will be displayed along with an audible warning.

Pressing the backup key will abort the erase and leave the data log intact.

Pressing the select key will delete all data in the data log.

CLEAR SYSTEM
Selecting this option will delete all system set-up data in the but will not delete the data log.

WARNING!

SELECTING THIS FUNCTION WILL ERASE SYSTEM SETTINGS

To delete the data log press the select key
You may have to enter the unlock code.

A warning dialog will be displayed along with an audible warning.

Pressing the backup key will abort the erase and leave the system settings intact.

Pressing the select key will delete all system settings.

Pressing the right key will display the *SERVICE* page.

Pressing the left key will display the *NETWORK* page.

SERVICE page

This page provides various types of system information and utilities intended for service engineers to check system performance and operation. The information and utilities are selected using the down key and is indicated in the upper right corner of the screen. Pressing the select key activates and available functions.

Firmware Version
The firmware version number is indicated at the upper right corner of the display.

SYSTEM MONITOR

This screen displays The following information.

- Supply voltage as both a graph and numeric value.
- Battery v voltage as both a graph and numeric value.
- RF signal strength as both a graph and numeric value (dbm).
- Ethernet connection status bar graph.
- Total data log entry count.
- New data log entry count.
- Data packets received while viewing this screen. This includes All handled packets and not just those logged.
- System real time clock count.

RESET RECEIVER

Pressing the select key with this option selected resets the receiver. This has the same effect as a power on reset.

SEND RF TEST PACKET

This is used to test the RF signal output.
Pressing the select key with this option selected causes the receiver to output a 1kHz RF test signal for 5 seconds.

CALCULATE CHECKSUM

This feature performs a system firmware checksum calculation to verify the integrity of the system program.
Pressing the select key starts this function.
The checksum is displayed when the function finishes and should match the value given in the Firmware version checksum table.

PERFORM SELF TEST
This function runs the full internal self test. Any faults found will be reported at the end of the test. Please do not press any keys during this test.

Pressing the select key starts the self test.

This screen also displays additional system configuration settings.

Internal Ram capacity is indicated along with the memory card capacity if one is fitted.
If a memory card is not found then '**NOT FOUND**' is displayed instead of the capacity.

The sensor lost contact interval is displayed. A value of 0 indicates that the lost contact timer is disabled.
The lost contact timer tracks signal from each sensor installed on the system, Wired or wireless, and will generate an alarm if data from any sensor is not received for the period set.

The status of the receiver alarm sounder is also displayed.
Off indicates that the receiver will not create any audible sounds during an alarm. All other alarm functions remain unchanged.
On indicates that the receiver will generate an audible tone during alarm conditions.

The Lost contact timer interval and alarm sounder setting can only be configured at the Atlas Technology factory.

VIEW RESET CODES
This feature allows the user to view the receiver reset codes. The receiver can distinguish between the various causes of a system reset. Up to the last 100 reset codes are stored in this list.

Pressing the select key selects this function.

Pressing the plus key scrolls down the list.

Pressing the minus key scrolls up the list.

Pressing the select key again exits this function.

VIEW ERROR CODES

This feature allows the user to view the receiver error codes. All functions within the receiver operating system are monitored and an error in any of them is reported to the system and stored in this list.

Pressing the select key selects this function.

Pressing the plus key scrolls down the list.

Pressing the minus key scrolls up the list.

Pressing the select key again exits this function.

BACKGROUND SIGNAL

Selecting feature displays a graphical, real time display of the RF signal level Over time. The display is continually updated from left to right. This Facility is intended to assist in fault finding should any outside interference Be suspected.

Pressing the select key adjusts the display update speed which is indicated as a value from 1 to 10 in the lower right corner of the graph.
1 is the slowest speed and 10 is the fastest.

Synapse Receiver Alarm Indication

In the event that a wireless sensor sends an alarm code to the receiver the following sequence of events takes place.

- The alarm data is saved to the data log
- The alarm data is displayed if the display page is selected
- The receiver volts free relay switches state for two seconds
- The receiver illuminated logo flashes as a visible warning
- An audible warning is given

The user can cancel the alarm indication by pressing any receiver key.
The alarm will however repeat in 15 minutes unless the cause of the alarm is rectified.

Should the receiver be connected to a Synapse Server Software then optionally an email and/or phone message will be sent to a selected contact.
See the Synapse Server Software help file for more details.

Data Packet Received Indication

Each time a valid data packet is received the Orange light in the centre of the illuminated Synapse logo blinks.
Note that not all received data packets are logged as some data packets are system control packets.

Synapse Transceivers

The System transceivers can run in two modes as indicated in the following table.

Mode	Purpose
Transceiver	Remote sensor operation
Transponder	System range extension signal repeater

Each of these two modes is explained in detail in the following sections.

- A unit will operate in one mode only at any one time.
  The required mode is selected by the supplier prior to shipping.

TRANSCEIVER

Firmware Version

When a battery is fitted to the unit a start up screen is displayed for 2 seconds which indicates the firmware version number installed in the unit.

IMPORTANT!
Observe battery polarity when inserting batteries. Incorrectly inserted batteries can permanently damage the unit.

- IF THE UNIT FAILS TO START THEN REMOVE THE BATTERIES AND WAIT FOR 30 SECONDS BEFORE REFITTING THEM.

Self Test

After the start up screen a self test is performed which will detect any internal faults and report these to the user via the display.

Mode Indication

Following a successful self test the current operating mode (TRANSCEIVER or TRANSPONDER) is indicated for two seconds. This section assumes that the unit is in TRANSCEIVER mode.

Main Display
The unit will then switch to the main display mode.
In this mode the following information is displayed.

Top line Channel 1 reading and state (OK / ALERT / ALARM)
Middle line Channel 2 reading and state (OK / ALERT / ALARM)
Bottom line Battery voltage or Count down to next data log

The information shown on the bottom line can be toggled from Battery voltage to Log timer by pressing the top two keys simultaneously.

Pressing the top right key will increase the screen contrast.
Pressing the top left key will decrease the screen contrast.

- Pressing the top left or right keys too many times in this mode may make the display unreadable.
  In this instance just keep pressing one key until the display becomes readable – This may take quite a few key presses.

In order to prolong battery life the display will go blank 15 seconds after the last key press. To 'wake up' the unit press any key.

Transceiver Menus
All other functions are accessed through three menus as outlined in the following table.
Once a setting is made in the menu system it is retained indefinitely even if the unit batteries are removed.

Menu	Purpose
SETUP	Allows access to the basic set-up parameters
INSTALL	Allows access to the unit installation parameters
CALIBRATION	Allows calibration of the sensor channels

The function of each item in these menus described in the following three tables.

Using the Menus
All menus function in the same way.
To move to a menu item press the Top right or top left key.
To select a menu item for adjustment press the bottom key.
Some menu Items are activated directly and are not used for adjusting values. For these cases the words 'Release Keys' will be displayed indicating that the keys must be released before the function will begin.
To adjust a value press the top right (increase) or top left key (decrease) until the required value has been set. In some cases holding the right or left key down for 2 seconds will cause the value to automatically change rapidly in the selected direction.

Once the value has been set press the bottom key again to exit setting mode and allow selection of another menu item.
The unit will exit the selected menu 60 seconds after the last key press unless in setting mode or the user can select the 'Exit' option from the menu.
If a decision has to be made in a menu (proceed / abort) then pressing either top key will abort the operation while pressing the bottom key will continue.

SETUP MENU
This menu is accessed by pressing the bottom key when the main display is visible. The following options are available from this menu.

Menu Item	Function
Exit	Exits the menu and returns to the main display
Test	Sends a test signal to the system receiver. Displays ***WAITING*** while the unit is waiting for a reply Press any key to abort the process **NO REPLY** if the unit times out before a reply is received In this case the unit will try again. **RECEIVED** This indicates that a replay has been received The bottom line indicates the time taken to Receive the reply in milliseconds (mS) If the Test key was held down for more than 5 seconds the word 'Diagnostic' will be displayed. In this case additional information relating to signal timing is displayed when a reply is received. This information is for low level system diagnostics and is not covered by this manual. The current ID number of the unit is also displayed on this screen.
ALL REMAINING MENU OPTIONS REQUIRE THE ENTRY OF THE PASSWORD UNLESS THE PASSWORD HAS BEEN DISABLED (By setting it to 0000)	
Set Password	Set / change the unit security password Setting the password to 0000 disables password security. NOTE That the password is required for all other menus if it is set here. CAUTION! If the password is lost for forgotten then the unit will have to be returned to the manufacturer for reprogramming. This is not covered under the warranty.
CH1 Enable	Setting this option to ON enables channel 1 functions

	Setting this option to OFF disables all channel 1 functions. This setting overrides the Data logging and Alarm option in the receiver for this unit.
CH1 Alert Low	Channel 1 Low alert level.
CH1 Alert High	Channel 1 High alert level.
CH1 Alarm Low	Channel 1 Low alarm level.
CH1 Alarm High	Channel 1 High alarm level.
CH1 Delay	Channel 1 Alarm delay
CH2 Enable	Setting this option to ON enables channel 2 functions Setting this option to OFF disables all channel 2 functions. This setting overrides the Data logging and Alarm option in the receiver for this unit.
CH2 Alert Low	Channel 2 Low alert level.
CH2 Alert High	Channel 2 High alert level.
CH2 Alarm Low	Channel 2 Low alarm level.
CH2 Alarm High	Channel 2 High alarm level.
CH2 Delay	Channel 2 Alarm delay
Log Interval	Data Logging interval
Low Battery	Setting this option to ‘ON’ enables the low battery alarm Setting this option to ‘OFF’ disables the low battery alarm

INSTALL MENU

This menu is accessed by pressing the bottom key and the top right key simultaneously when the main display is visible. If the password has been enabled then this will have to be entered before this menu can be accessed. Attempting to access this menu will produce a warning. Pressing either top key will abort the menu entry while pressing the bottom key will proceed with the function.

As indicated in the warning it is important that all settings are understood as any incorrect settings can cause the unit to stop working.

The following options are available from this menu.

Menu Item	Function
Exit	Exits the menu and returns to the main display
ID Number	Sets the unit ID number All remote units in a system must be assigned a unique ID number. This number is used throughout the system to identify this particular unit. Great care must be taken to ensure that no two units on the same receiver system have the same ID number.
Receiver ID	Sets the Receiver number that this unit will communicate

	with. This value MUST match the Receiver ID setting in the receiver that the unit is to communicate with. If it does not then the two units will not be able to communicate.
Auto Gateway	Runs the automated gateway search function and automatically selects the best gateway. See the section *Synapse System Installation* for more details.
Find Gateway	Runs the automated gateway search function. See the section *Synapse System Installation* for more details.
Set Gateway	Manually set the required system gateway. See the section *Synapse System Installation* for more details.
Meter	Displays a bar graph style meter indicating RF signal. This is a real time reading that show the actual background signal level and is used for diagnostics.
Background	Displays the RF signal in dbm. This is a real time reading that show the actual background signal level and is used for diagnostics.
Reset Unit	Performs a full unit reset. This is similar to a power on reset.
Probe Type	This menu item allows the selection of the correct probe type and must match the actual probe fitted otherwise a 'probe fault' will be produced. The following table indicates the available probe types.

Available Probe types

Type	CH1 min	CH1 max	Unit	Resolution	CH2 min	CH2 max	Unit	Resolution	
0	-40	124	C	0.1C	0	100	%RH	0.1	Temp & %RH
1	-200	200	C	0.1C					Extended Temp
3	0	100	ppm	0.1ppm					Ethylene
4	-250	250	Pa	0.1Pa					Pressure
5	0	20	%	1%					Carbon Dioxide
7	0	100	%	1%					Level (eg liquid)
9	-40	120	C	0.1C					Temperature
10	-20	80	C	0.1C	-20	80	C	0.1C	Dual Temp

CALIBRATION MENU

This menu is accessed by pressing the bottom key and the top left key simultaneously when the main display is visible. If the password has been enabled then this will have to be entered before this menu can be accessed. Attempting to access this menu will produce a warning. Pressing either top key will abort the menu entry while pressing the bottom key will proceed with the function.

As indicated in the warning it is important that all settings are understood as any incorrect settings can cause the unit to stop working.

The following options are available from this menu.

Menu Item	Function
Exit	Exits the menu and returns to the main display
CH1 Cal	Calibrate Channel 1 See the section *Synapse Transceiver Calibration* for more details.
CH2 Cal	Calibrate Channel 2 See the section *Synapse Transceiver Calibration* for more details.

ALERT AND ALARM INDICATION

The Synapse Transceiver constantly monitors the probe values for all enabled channels even when the display is blanked.

The measured probe value is compared against the user defined ALERT and ALARM limits.

As long as the measured values remain within both the ALERT and ALARM limits then the unit simply logs data at the specified interval. If the display is active then ‘OK’ is shown following the displayed channel value on the LCD display.

ALERT

Should the measured value exceed either the High or Low ALERT limit then an ALERT alarm code is sent immediately to the receiver. If the display is active then ‘ALE’ is shown following the displayed channel value on the LCD display.

Once an ALERT has be triggered for a given channel then the channel value must return and remain within the set limits continuously for 60 min before another ALERT can be given

- Only one alert is produced per excursion.

ALARM
Should the measured value exceed either the High or Low ALARM limit then the ALARM DELAY timer begins counting down from the programmed ALARM DELAY. Should the timer expire then an ALARM code is sent to the receiver. The timer is reset if the measured value returns (even briefly) to within the programmed limits. If the display is active then 'ALA' is shown flashing following the displayed channel value on the LCD display.
Following the first Alarm event for a given excursion then further alarms are produced every 30min (Not the ALARM DELAY period) until the alarm condition is rectified.

Low Battery Alarm
Should the battery voltage in the unit drop below 2.5 volts and the low battery alarm is enabled then a LOW BATTERY alarm is sent to the receiver.

Alarm Precedence
Should more than one alarm occur at the same time then they are dealt with using the following rules.

A low battery alarm will override any other alarm type.
An 'ALARM' event will override an 'ALERT' event.
Channel 1 Alarms are dealt with before channel 2 alarms, assuming that both channels are enabled.

Possible alarms

The following table lists the possible alarms that the system can generate and also indicates where the alarm originates.

Alarm	Description	Source
Low Battery	The battery in unit n is less than 2.5V	Transceiver n
CH1 High Alert	Unit n Channel 1 High Alert level has been exceeded	Transceiver n
CH1 Low Alert	Unit n Channel 1 Low Alert level has been exceeded	Transceiver n
CH1 High Alarm	Unit n Channel 1 High Alarm level has been exceeded	Transceiver n
CH1 Low Alarm	Unit n Channel 1 Low Alarm level has been exceeded	Transceiver n
CH2 High Alert	Unit n Channel 2 High Alert level has been exceeded	Transceiver n
CH2 Low Alert	Unit n Channel 2 Low Alert level has been exceeded	Transceiver n
CH2 High Alarm	Unit n Channel 2 High Alarm level has been exceeded	Transceiver n
CH2 Low Alarm	Unit n Channel 2 Low Alarm level has been exceeded	Transceiver n
Lost Contact	Unit n has failed to communicate with the receiver for an excessive period	System receiver

Note that the receiver can indicate other alarm conditions which are specific to the receiver, such as low battery' but these are not logged and are only used to alert the end user.

Synapse Transceiver Calibration

This section describes the basic procedure to follow in order to calibrate the Synapse transceiver.
The purpose of the calibration procedure is to adjust the indicated value given by the Synapse transceiver so that it matches the reading displayed on a calibrated test meter.
Given here is the means by which the adjustment is made but the actual calibration method may vary depending on the type of probe fitted and the type of test equipment available.

The calibrated reference meter probe should be placed as close as possible to the Synapse transceiver probe and if possible both probes should be immersed in a liquid with high heat conductivity. On no account should the Synapse transceiver be placed in liquid as this would permanently damage the unit.
Both the Synapse transceiver and the reference meter should be allowed to settle such that both readings have stabilised.
The calibration menu should be accessed, refer to the section *CALIBRATION MENU* for more details.
Select the calibration menu option for the channel to be calibrated.
The bottom line of the LCD display on the Synapse transceiver shows the current probe reading and the probe channel calibration offset value.
The offset value is shown so that the calibration can be returned to the current value if required.
Use the top right and top left key to adjust the displayed reading to match the reference meter +/- the least significant digit.
The top right key will increase the indicated value and the top left will decrease the indicated value.
The calibration offset values are saved when the calibration menu is closed and will not change until adjusted in the calibration menu again even if the transceiver batteries are removed.
This process should be repeated for all enabled channels. If a channel is not in use then it need not be calibrated.

For multipoint calibration the above procedure should be repeated with the probes subject to a range of conditions as required by the multipoint range required.

Synapse Transponders

Synapse transponders are used to extend the range of the Synapse system to enable any area to be covered. It is important to understand that the signal from a transponder has no more range that a standard unit. It is used to repeat the signal in order to extend the fundamental range of the system receiver.
Transponders are running continuously so they must be connected to a mains power supply using the supplied power adaptor. Although they are battery backed it is not intended that they be run from battery power alone as this will quickly drain the batteries.
Should power be lost then the transponder will automatically switch to battery power. The end user should take into account how often the power has been off when determining a transponder battery replacement period.

TRANSPONDER

Firmware Version

When a battery is fitted to the unit a start up screen is displayed for 2 seconds which indicates the firmware version number installed in the unit.

IMPORTANT!
Observe battery polarity when inserting batteries. Incorrectly inserted batteries can permanently damage the unit.

- IF THE UNIT FAILS TO START THEN REMOVE THE BATTERIES AND WAIT FOR 30 SECONDS BEFORE REFITTING THEM.

Self Test

After the start up screen a self test is performed which will detect any internal faults and report these to the user via the display.

Mode Indication

Following a successful self test the current operating mode (TRANSCEIVER or TRANSPONDER) is indicated for two seconds. This section assumes that the unit is in TRANSPONDER mode.

Main Display
The unit will then switch to the main display mode.
In this mode the following information is displayed.

Top line Displays ‘TRANSPONDER’
Middle line Displays a scanning symbol or ‘TRANSACTION’
Bottom line Displays ‘SCANNING’

When the transponder receiver a signal that is directed to its own gateway number it displays the word ‘TRANSACTION’ in the middle line of the display And forwards the signal to it’s own gateway. When it receives the return packet it sends this packet back to the calling unit and replaces ‘TRANSACTION’ with the scanning symbol indicating that it is ready for the next transaction.
If no reply is received then the transaction will time-out after 2.5 seconds and The unit will return to scanning mode.

- A transponder will ignore all other requests when a transaction is in progress.

Sending a Test Signal
Pressing the bottom key while the scanning symbol is displayed will send a test signal which is ultimately destined for the system receiver. The receiver recognises this as a special transponder test signal and will reply with a successful reception packet.
During the test signal the display displays the following information.

WAITING while the units is waiting for a reply
Press any key to abort the process
NO REPLY if the unit times out before a reply is received
In this case the unit will try again.
RECEIVED This indicates that a replay has been received
The bottom line indicates the time taken to receive
The reply in milliseconds (mS)

If the Test key was held down for more than 5 seconds the word ‘Diagnostic’ will be displayed.
In this case additional information relating to signal timing is displayed when a reply is received. This information is for low level system diagnostics and is not covered by this manual.

Transponder Menu

Most transponder functions are accessed through a single menu as outlined in the following table.
Once a setting is made in the menu system is retained indefinitely even if the unit batteries are removed.

Menu	Purpose
INSTALL	Allows access to the unit installation parameters

The function of each item in this menu is described in the following table.

Using the Menu

To move to a menu item press the Top right or top left key.
To select a menu item for adjustment press the bottom key.
Some menu Items are activated directly and are not used for adjusting values. For these cases the words 'Release Keys' will be displayed indicating that the keys must be released before the function will begin.
To adjust a value press the top right (increase) or top left key (decrease) until the required value has been set. In some cases holding the right or left key down for 2 seconds will cause the value to automatically change rapidly in the selected direction.
Once the value has been set press the bottom key again to exit setting mode and allow selection of another menu item.
The unit will exit the selected menu 60 seconds after the last key press unless in setting mode or the user can select the 'Exit' option from the menu.
If a decision has to be made in a menu (proceed / abort) then pressing either top key will abort the operation while pressing the bottom key will continue.

INSTALL MENU

This menu is accessed by pressing the bottom key and the top right key simultaneously when the main display is visible. Attempting to access this menu will produce a warning. Pressing either top key will abort the menu entry while pressing the bottom key will proceed with the function.
As indicated in the warning it is important that all settings are understood as any incorrect settings can cause the unit to stop working.
The following options are available from this menu.

Menu Item	Function
Exit	Exits the menu and returns to the main display
ID Number	Sets the unit ID number This is actually the gateway number for this unit. NOTE This is the gateway number that this unit will respond to and is not the gateway number that the unit communicates with.

Low Battery	This option enables or disables the unit low battery alarm. When enabled the unit will produce an alarm should the internal battery voltage drop below 2.5 volts. When disabled no low battery alarm will be produced.
Receiver	
Auto Gateway	Runs the automated gateway search and configuration function. See the section *Synapse System Installation* for more details.
Find Gateway	Runs the automated gateway search function. See the section *Synapse System Installation* for more details.
Set Gateway	Manually set the required system gateway. See the section *Synapse System Installation* for more details.
Meter	Displays a bar graph style meter indicating RF signal. This is a real time reading that shown the actual background signal level and is used for diagnostics.
Background	Displays the RF signal in dbm. This is a real time reading that shown the actual background signal level and is used for diagnostics.
Reset Unit	Performs a full unit reset. This is similar to a power on reset.

Synapse System Installation

Synapse is a highly integrated system in which all the components for a part of the overall system. Therefore to ensure correct and trouble free operation it is essential that all system components are correctly installed and configured. It is beyond the scope of this manual to cover all possible system configurations so this section will describe the general set-up requirements for the system.

Step1 – Receiver Installation

The first step in installing the system is to find a suitable location for the system receiver. A location should be selected that is a far away from possible sources of interference as is possible.
Possible sources of interference include, but are not limited to

- Mains wiring
- High power RF equipment
- Large electric motors
- High power switching equipment
- Computers
- Large industrial equipment
- Network Hubs and cables
- Walls, especially metal clad or shielded
- Ventilation ducts
- Heating and plumbing systems
- Large metal enclosed equipment (fume cabinets/freezers etc.)
- Water tanks

Once a suitable location has been selected the receiver should be mounted in it's final location. It is important to do this first as all subsequent signal measurements rely on the receiver not moving from this location.
After the receiver has been installed it should be correctly configured, Refer to the *Synapse Receiver Operation* section for details on possible configuration settings. It is important at this stage to set the Receiver ID and remote sensor configurations.

Step 2 – Transponder Installation

Following installation of the receiver the system transponders should be installed. The purpose of the transponders is NOT to boost the signal but to repeat it. Not all installations will require transponders as the requirement is entirely dependant on the size of the area to be covered and the environmental conditions.
Suitable locations should be selected in order to provide complete coverage of the areas in which transceivers will be located.
Reference to a scale floor plan is useful for planning the layout.
The Transponders should be sited starting with the ones closest to the receiver.
The same guidelines with regards to avoiding interference that apply to receivers also apply to transceivers.
There is no absolute method for correctly locating transponders and must be done empirically.
Start by selecting a location which is within range of the receiver and some way towards the area you wish to extend the system into.
Enter the installation menu and set the transponder ID number to the next available number that has not yet been used in the system.
Note that it is the responsibility to ensure that ID numbers used throughout the system conform to the system requirements.
Next select ‘Find Gateway’ from the installation menu and allow the unit to search for all possible gateways. The transponder MUST be in it’s final location when this is performed.
Should no gateway be found then the unit needs to be relocated and the procedure repeated. This process will have to be repeated until the unit can find a suitable gateway.
It is important that the transponders nearest the receiver find gateway ‘0’ as this is the receiver.
Once a transponder has been installed leave it running and move on to the next transponder to be included in the system.
The aim in installing transponders is to provide a ‘chain’ from a transceiver back to the receiver in as few ‘links’ as possible. When there are multiple transponders is a system the gateway search function may find several gateways and will offer you them in the ‘strongest signal first’ order. This may not be the best selection so an overall understanding of the system layout is required to obtain an optimum set-up.
If the gateway that you want to use cannot be found then the unit should be relocated.
The transponders are mains powered and it is important that their power supplies cannot be inadvertently switched off. This is the responsibility of the end user and not the installation engineer.
Once all transponders have been installed they should be tested for reliable signal link with the receiver. See the section *Synapse Transponders* for details on how to do this.

Step 3 – Transceiver Installation

Once all the transponders have been installed the transceivers should be installed and configured.
Exact physical installation will vary depending on the probe type fitted and the equipment to be monitored and it is beyond the scope of this manual to cover all possible probe installations. It is therefore assumed that a suitable method of probe location has been found and the sensor unit is mounted in a suitable position.
The same guidelines with regards to avoiding interference that apply to receivers also apply to transceivers.

It is especially important that the antennas are as far from any metal objects as possible and if mounted on a steel cabinet of any kind (fridges, freezers etc) then they should be mounted toward the top of the cabinet side such that the antenna extends beyond the top of the cabinet. In all cases the units must be mounted with the antenna in a vertical plane.
Once mounted the installation menu should be accessed, See the section *Synapse Transceivers* for details on how to do this.
Select a suitable ID number ensuring that the number is unique in this system.
Set the Receiver ID to match the actual receiver ID setting.
Next select ‘Find Gateway’ from the installation menu and allow the unit to search for all possible gateways. The transceiver MUST be in it’s final location when this is performed.
Should no gateway be found then the position of the transponders should be reviewed and this process repeated. This process will have to be repeated until the unit can find a suitable gateway.
Once the unit has been installed check that is can communicate with the receiver by sending a test signal. Refer to the section *Synapse Transceivers* for details on how to do this.
Once proper communications have been established the remaining unit parameters should be configured as required in order to meet the needs of the end user.
These include
Enable/Disable channels as required
Set High/Low Alert levels
Set High/Low Alarm levels
Set Alarm delays as required
Set the data logging interval
Enable/disable the low battery alarm as required.

Automatic Gateway installation

The **Zen** configuration system

It is important to note that if this method of installation is used then all system units must be configured using either the *auto gateway* or *find gateway* options. No system units should be manually configured.
It is not possible to provide a detailed guide for every type of installation so this section is aimed at providing a general method of system installation.
The following diagrams are intended to indicate the general steps required during installation as well as the system installation concepts.

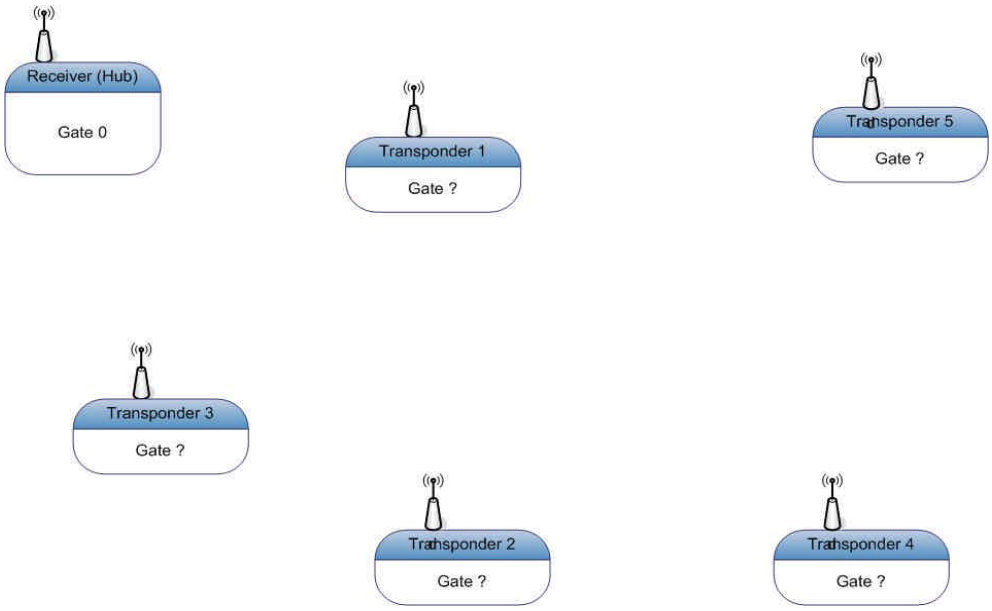
Step A – Receiver installation

The system receiver should be installed as previously explained.

Step B – Transponder installation

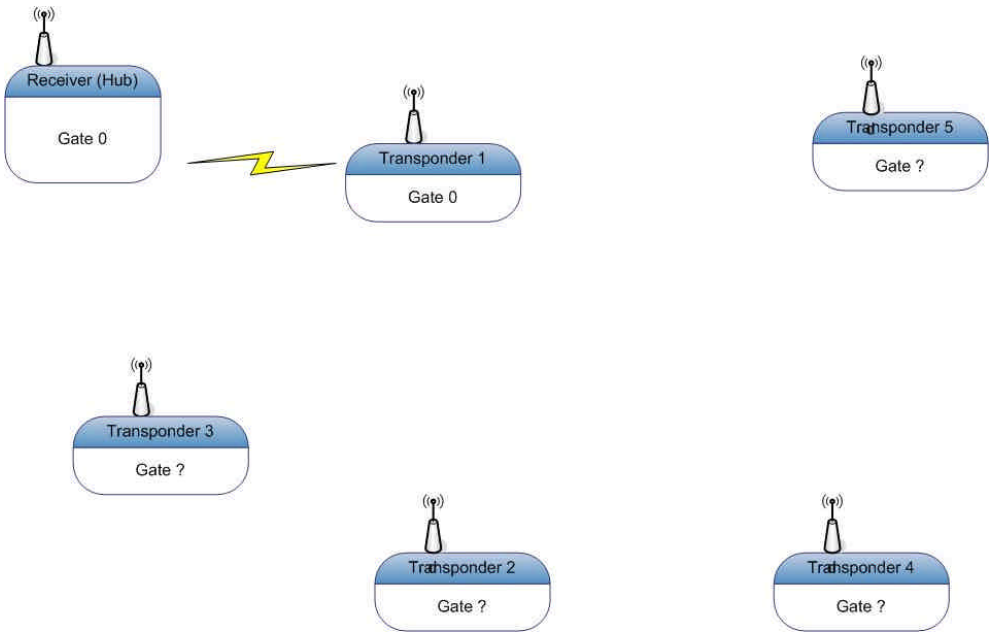
Transponders are installed in order to provide additional area coverage. It is important to understand that the transponders do Not have a greater RF range than the system receiver or transceivers but are used to 'repeat' the signal where required thus extending the range in the same way that a chain is longer than a single link.
Transponders are therefore located in suitable locations to provide the required area coverage.
The transponders must be configured one at a time starting with the one(s) closest to the receiver.
Non-configured transponders must not be switched on until they are being configured and all previously configured transponders must be left on.
The receiver must also be properly located and configured before transponder installation begins.

The following image shows an imaginary system containing 5 transponders.



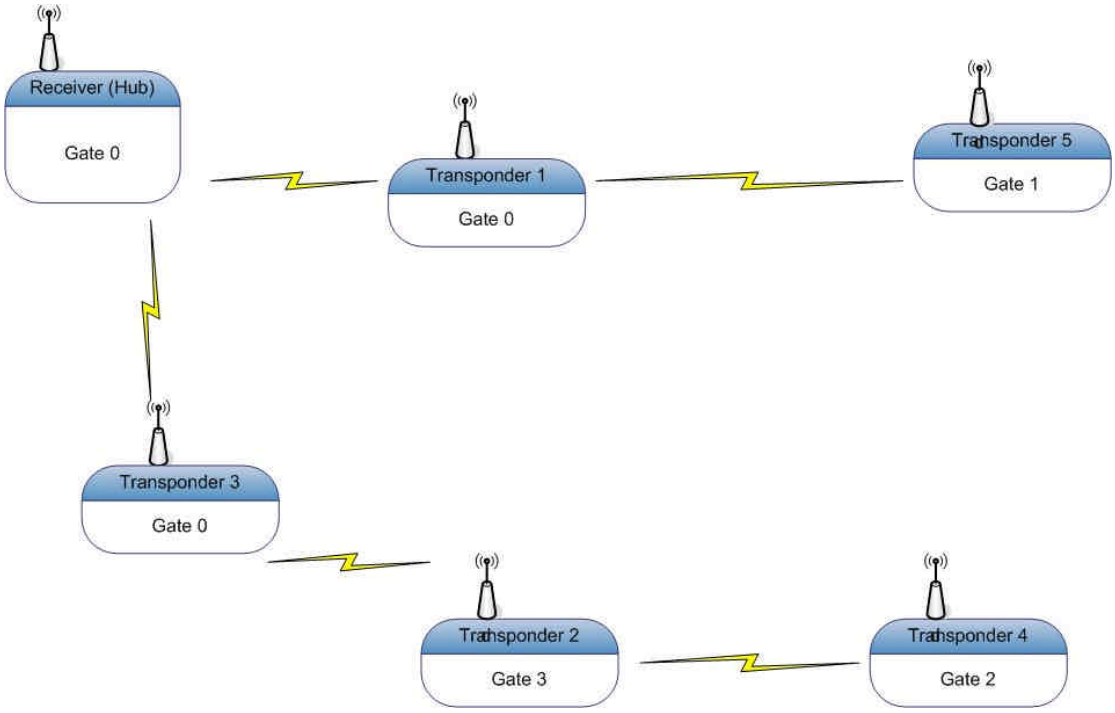
In a real installation these transponders may be spread out over some considerable distance and it may be difficult to judge the actual distances. Note that each transponder has already been configured with an ID number (1 to 5). Also note that the receiver is already configured as gate 0. This cannot be changed as the receiver must always be gate 0 for the system to operate correctly. The order of the transponder ID numbers is unimportant but it is important that each transponder has a unique ID number. See the section on transponder configuration for details on how to assign transponder ID numbers.
Although the transponders already have ID numbers they cannot yet communicate either with the receiver or with each other as they do not yet have assigned gateway numbers as indicated by the ? in each.
While on paper it would be and easy task to assign each transponder a gateway number it can be very difficult and error prone to attempt this manually in a real world installation and this is where the auto gate function starts to show its value.
As with any RF system, Synapse could potentially be influenced by local environmental conditions so that the 'shortest' route may not always be the best.
The auto gateway system can automatically determine the best connection route for all the system units which will take into account any potential for interference as is often the biggest issue with most RF systems.

Configuring the gateways.
Start with transponder 1 (in this imaginary system) and select the *auto gateway* function from the install menu. Note that the transponder Must be in it's final location before starting this function.
The unit will automatically search for the shortest and most 'robust' link to the system receiver (hub).
The following diagram shows the possible configuration after this function has been run.



Note that transponder has now configured itself with a gateway of 0 and a two way link has been established between it and the system receiver.

Repeat this process for each remaining transponder. The order should be determined based on approximate distance of each unit from the previous.
In this case an appropriate sequence may be 3, 2, 5, 4
In some cases it may be necessary to try a different sequence or even relocate a transponder if a suitable gateway cannot be found.
Following *auto gateway* configuration for each unit the configuration diagram might look like this.

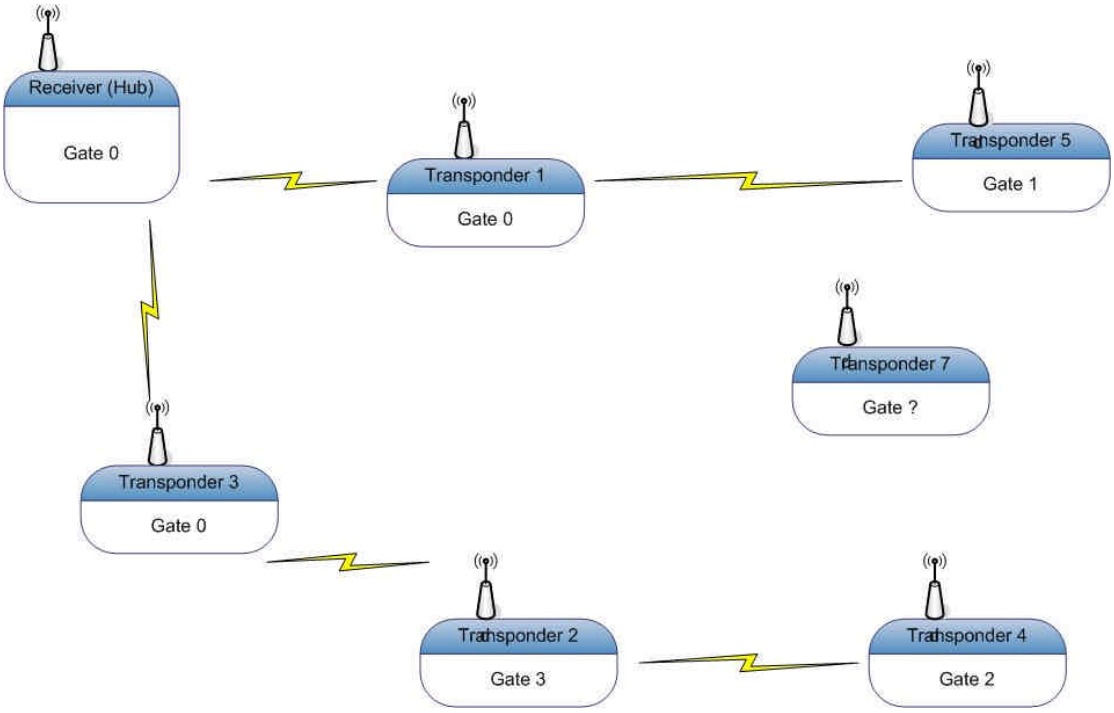


The important point to note is that each unit only communicates with one other through a specific path. This eliminates the most common problem inherent in most RF system which is caused by more than one device transmitting at any one time.

Once the system infrastructure (receiver and transponders) is configured it becomes a dynamic self healing system. If one unit fails then the other units will attempt to find the next best route for the data.

The real power of the **Zen** protocol can start to be gleaned if it becomes necessary to add additional transponders (or transceivers) to the system. This has always been the point at which even the best behaved RF systems start to fall apart.

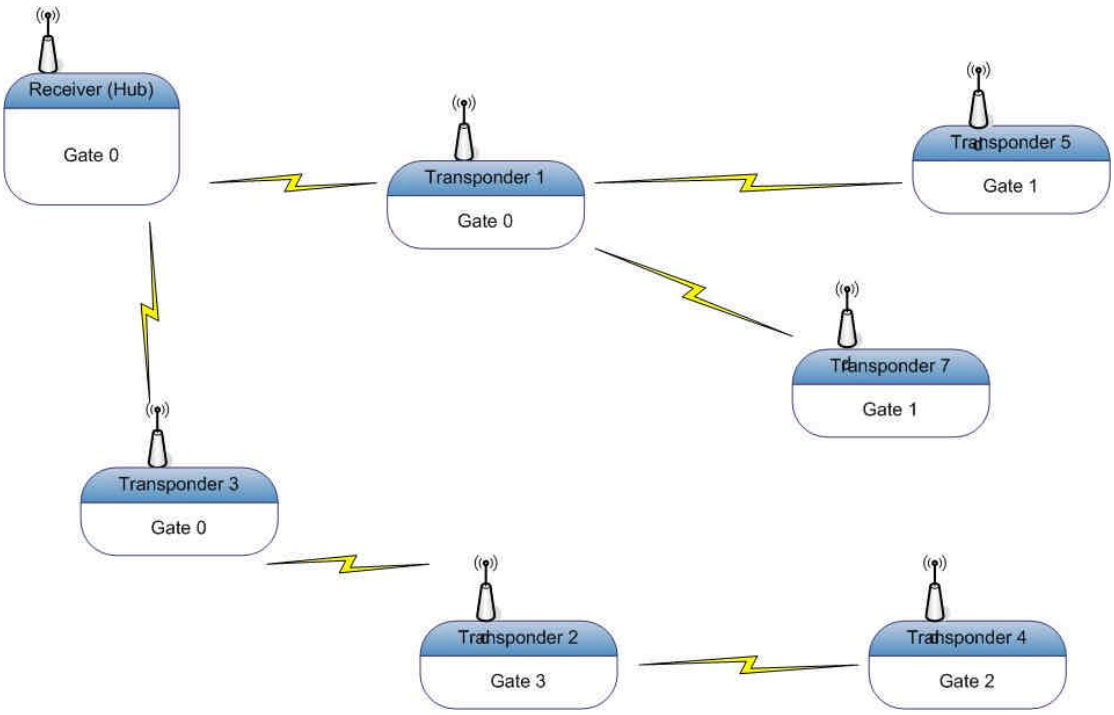
The following image shows the (imaginary) location of a new transponder that is required to expand system coverage.



The transponder has already been assigned an ID of 7 (Note that the ID numbers do not need to be sequential but must be unique).
The difficulty would normally be,
Which existing transponder should it be configured to communicate with ?

A simple auto-search function may select unit 5 or 4 as these are obviously closer and may have a stronger signal.
The **Zen** protocol uses an intelligent neural algorithm to determine the best node to communicate with based on many variables but will always ensure that there is a sufficiently strong RF link as well as aiming for the most efficient and robust overall system configuration.

After running the *auto gateway* function on the new transponder the system configuration may look as follows.

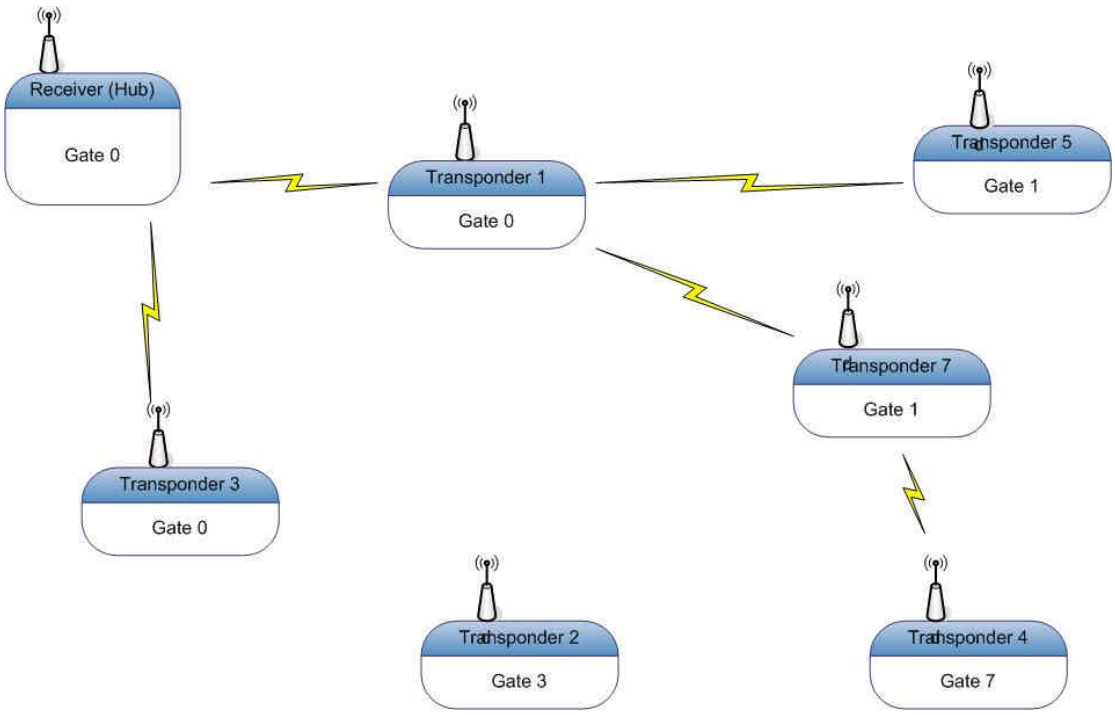


Note that the unit configured itself to communicate with transponder 1 instead of either 4 or 5.
This provides for a much more efficient link to the system receiver.
The auto gateway feature becomes more important as the size and complexity of the system grows and allows for easy system expansion.
This feature also means that changes to the system can be completed quickly and easily even if the location of all the system transponders is unknown.

Self Healing

In the event of a unit failure the system will attempt to self heal and find an alternate configuration to prevent data loss.
It will always produce an alarm should this happen to allow the system administrator(s) to take appropriate action but in the mean time will allow the system to continue operating.
This feature would be all but impossible with a wired system.

The following image shows the system configuration should Transponder 2 fail (No user intervention required).



Note that any gateway that would normally use transponder 2 has reconfigured itself to use and alternative.

C – Transceiver installation

Following installation of all the required system transponders the system transceivers should be installed.
These can be installed in any order but each must have a unique ID number.
Simply install the transceiver and probe in the required location and run the *auto gateway* function.
The unit will automatically configure the most suitable data communication path even if you have no knowledge of the location(s) of the system transceivers or receiver.
Again this can be especially useful in the event that you wish to relocate an existing sensor or install additional sensors.

Step 4 - Receiver network connection

If the system is to be used as over a network then the site IT department should be consulted and the receiver set-up accordingly.
See the section *Synapse Receiver* for details on possible receiver set-up options.

Step 5 – Synapse Server Software Installation

Once all the hardware has been installed the System software should be installed. See the Software installation guide for details on Software Installation.

Step 6 – Synapse Client Software Installation

Once the Synapse Server software has been installed the Client application should be installed on all required computers.
See the Software installation guide for details on Software Installation.

System Specification

Transceiver Specification

RF Specification (Receive)

Operating Frequency	434.010MHz
Bandwidth	64KHz
Sensitivity	-108dbm
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).

RF Specification (Transmit)

Operating Frequency	434.010MHz
Maximum Output Power	10mW
Modulation	FSK
Bandwidth	64KHz
Max transmit duration	53mS
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).
Range open ground	500m approx
Range inside building	60m approx
	NOTE range is influenced by many things so the installer should check for correct operation of the system after installing.
Power source	2 x AA battery
Average Power Consumption	100uA approximate
Peak Consumption	45mA
Weight without batteries	145g approx.
Weight with batteries	200g approx
Height	113mm
Height (with antenna)	278mm
Width	73mm
Depth	23mm
Installation	Wall mounted
RF Protocol	Half Duplex
Coding	Proprietary
Bit Rate	4800 Bps
Display	LCD 3 line STN

Transponder Specification

RF Specification (Receive)

Operating Frequency	434.010MHz
Modulation	FSK
Bandwidth	64KHz
Sensitivity	-108dbm
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).

RF Specification (Transmit)

Operating Frequency	434.010MHz
Maximum Output Power	10mW
Modulation	FSK
Bandwidth	64KHz
Max transmit duration	53mS
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).

Range open ground	500m approx
Range inside building	60m approx NOTE range is influenced by many things so the installer should check for correct operation of the system after installing.

Power source	3V DC regulated power adaptor
Battery Backup	2 x AA battery
Average Power Consumption	39mA approximate
Peak Consumption	45mA

Weight without batteries	145g approx.
Weight with batteries	200g approx
Height	113mm
Height (with antenna)	278mm
Width	73mm
Depth	23mm

Installation	Wall mounted

RF Protocol	Half Duplex
Coding	Proprietary
Bit Rate	4800 Bps

Display	LCD 3 line STN

Receiver Specification

RF Specification (Receive)

Operating Frequency	434.010MHz
Bandwidth	64KHz
Modulation	FSK
Bandwidth	64KHz
Sensitivity	-110dbm
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).

RF Specification (Transmit)

Operating Frequency	434.010MHz
Maximum Output Power	10mW
Bandwidth	64KHz
Max transmit duration	53mS
Antenna	165mm 1/4wavelength whip. (Permanently Fixed and not changeable by the user).
Range open ground	600m approx
Range inside building	70m approx
External Power source	12V DC Adaptor 500mA Plug Top
Internal Battery fuse	1A As
Battery Backup	8.4V 3.7Ah NimH battery
Average Power Consumption	300mA approx.
Peak Consumption	800mA
Weight without battery	1.15kg approx.
Weight with battery	1.90kg approx.
Height	225mm
Height (with antenna)	395mm
Width	325mm
Depth	50mm
Display	Graphic Backlit LCD 110mm x 60mm viewable area
Installation	Wall mounted
Alarm Output	Volts free contact SPCO
Data output/Control interface	Ethernet (CAT5) using Synapse Software
Network Protocols	TCP/IP UDP ICMP ARP DHCP
Data Storage	196512 data points using internal (Up to approx 770 Million with memory card fitted)
Memory card	SD/MMC 4Mb to 4Gb

Probe Types

Sensor Specification – Probe Types

Standard Temperature and Humidity Sensor (Internal) – Probe Type 0

Temperature

Type	Digital
Range	0 – +40C
Resolution	Measured 0.04C
	Indicated 0.1C
Repeatability	+/- 0.1C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	5 minutes

Humidity

Type	Digital
Range	0 – 100%
Resolution	measured 0.03%
	Indicated 0.1%
Repeatability	+/- 0.1%
Accuracy	+/- 2%
Accuracy Uncertainty	< 10% > 90% = +/- 4% max
Linearity	< 1%
Response time 1/e(63%)	4 seconds (slowly moving air)
Hysteresis	+/- 1%
Long term stability	< 1%/yr

Standard Temperature and Humidity Sensor (External Only) – Probe Type 0

Temperature

Type	Digital
Range	-40 – +123.8C
Resolution	Measured 0.04C
	Indicated 0.1C
Repeatability	+/- 0.1C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	30 seconds

Humidity

Type	Digital
Range	0 – 100%
Resolution	measured 0.03%
	Indicated 0.1%
Repeatability	+/- 0.1%
Accuracy	+/- 2%
Accuracy Uncertainty	< 10% > 90% = +/- 4% max
Linearity	< 1%
Response time 1/e(63%)	4 seconds (slowly moving air)
Hysteresis	+/- 1%
Long term stability	< 1%/yr

Standard Temperature only Sensor (External Only) – Probe Type 9

Temperature

Type	Digital
Range	-40 – +80C
Resolution	Measured 0.1C
	Indicated 0.1C
Repeatability	+/- 0.2C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	20 seconds

Extended Temperature Sensor (External only) – Probe Type 1

Temperature

Type	PT100
Range	-200 – +200C
Resolution	Measured 0.05C
	Indicated 0.1C
Repeatability	+/- 0.1C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	20 seconds (depending on structure)

CO2 Sensor (External only) – Probe Type 5

Type	Proprietary
Range	0 – 20%
Resolution	0.1%
Repeatability	0.01%
Accuracy	< +/-0.02% + 2% of reading (@ normal atomosphere)
Response time 1/e(63%)	30 seconds

Ethylene Sensor (External only) – Probe Type 3

Type	Proprietary
Range	0 – 25ppm
Resolution	0.1ppm
Repeatability	0.1ppm
Accuracy	+/- 0.2ppm
Response time 1/e(63%)	3 minutes

Pressure Sensor - Pascals (Internal Only) – Probe Type 4

Type	Proprietary
Range	-250 – +250Pa
Resolution	0.1Pa
Repeatability	0.1Pa
Accuracy	+/- 0.5Pa
Response time 1/e(63%)	0.1 Second
Non Linearity	+/- 0.25% FSS

Pressure Sensor - millibars (Internal Only) – Probe Type 8

Type	Proprietary
Range	-12.5 - + 12.5mb
Resolution	0.1mb
Repeatability	0.1mb
Accuracy	+/- 0.3mb
Response time 1/e(63%)	0.1 Second
Non Linearity	+/- 0.25% FSS

Dual Temperature and Door switch Sensor (External Only) – Probe Type 10

Air - Temperature

Type	Digital
Range	-40 – +80C
Resolution	Measured 0.1C Indicated 0.1C
Repeatability	+/- 0.2C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	20 seconds

Load - Temperature

Type	Digital
Range	-40 – +80C
Resolution	Measured 0.1C Indicated 0.1C
Repeatability	+/- 0.2C
Accuracy	+/- 0.5C @ 25.0C
Response time 1/e(63%)	20 seconds

Door Sensor

Type	Magnetic Proximity
Contacts	Normally Closed

Note: Data is not logged for the door switch